explorers in the Andes have been recognised by the authors also in the Himalayan region, though their conclusions have not been completely accepted by other travellers. They, however, bring together in this work observations made in the Nun Kun area during 1906, as well as others made before and since in other parts of the north-west Himalaya, and have a right, consequently, to generalise on the phenomena. The prominences grouped under the name *nieve penitente* are often roughly pyramidal in shape, and generally disposed in rows on snow and ice at altitudes at which the night temperature falls below the freezing point; they are due to the unequal melting of the superficial layers of snow and ice. The authors describe in detail eight varieties of *nieves penitentes,* which, judging by the descriptions given, might have been divided into the following two groups:—(i.) Those that are the outward and visible expression of an internal heterogeneity of physical structure induced in the snow and ice by (1) the scoring action of avalanches with a trend parallel to the dip-slope; (2) the shearing effects of slower subsidence along the slopes; (3) the development of pressure waves by the wind; and (4) the more or less regular fracturing on seracs. (ii.) Those that are due to the disposition of various adventitious covers, such as (5) thin patches of earthy material arranged by the wind, and of a kind facilitating the absorption of the sun's heat with consequent melting of the subjacent ice; (6) heavy rock-masses, which compress and protect the ice, giving rise, by melting of the clean ice around, to the well-known glacial tables; (7) thick layers of earthy material, having a protective effect similar to that of the large rock fragments, but giving rise to differently shaped prominences on account of the disintegration and fall of the marginal parts of the covers; (8) water-covers in depressed areas, where silt is deposited unequally on a previously sculptured surface. These phenomena have been discussed in greater detail by Dr. Workman in special papers published in the *Zeitschrift für Gletscherkunde* and in the *Alpine Journal.*

A notice of this book would not be complete without reference to the remarkably fine photographic plates with which it is illustrated, although the illustrations, specially selected to demonstrate the phenomena of *nieve penitente,* and perhaps the best in the book, are taken from other areas, mainly from the Hispar and associated glaciers, further north-west, in the chiefship of Nagar. One of these is here reproduced.

T. H. Holland.

THE EAST AFRICAN NATURAL HISTORY SOCIETY.[1]

THERE has been founded in British East Africa a society for the study of natural history, and the activities of this society naturally extend to the adjoining Uganda Protectorate. This society recently produced the first number of a Journal, which, it is to be hoped, may run to many volumes if conducted on the lines of its first number. Mr. C. W. Hobley, C.M.G., a prominent official of British East Africa, whose service there dates from the earliest days of the British East Africa Chartered Company, has taken a considerable part in the founding of this local natural history society, and is one of the contributors to the first number of the Journal. Mr. Hobley's work in anthropology, in East African languages, in geology, in the exploration of the aquatic fauna of Lake Victoria Nyanza (it will be remembered that he was the first, or one of the first, to discover in that lake organisms akin to the supposed marine fauna of Lake Tanganyika, thereby lessening the acuteness of that problem), has been so remarkable that his association with the Natural History Society should be productive of interesting results.

This first number contains a very well-executed coloured illustration of a new species of francolin (*Francolinus hubbardi).* This accompanies an article on the francolins of East Africa and Uganda, which to ornithologists is of real value. The scope of this article also includes the allied genus Pternistes. Mr. Battiscombe gives some new and interesting information regarding the flora of British East Africa. There are several small errors in the nomenclature of this article; *Lobelia johnstoni* is given as *Lobelia johnsonii*; *Kniphofia thomsoni* appears as *K. thompsonii,* and *Musa livingstonii* is given as *M. livingstonia.* The generic name Sanseviera is misspelt—a very common fault in books dealing with Africa. But these are trifling defects in an account of East African botany which is of considerable interest.

The Rev. K. St. A. Rogers writes on East African butterflies. There are notes on the haunts and habits of the elephant on the Guas' Ngishu plateau by Mr. Hoey, and Mr. C. W. Hobley contributes two articles, the more important of which, from the point of view of new information, is that dealing with the Kariandoss deposits of the Rift Valley—deposits which form beds of a mealy, friable rock, amounting perhaps to millions of tons of diatomite. This is a siliceous deposit, principally of organic origin, mainly composed of the skeletons of minute, lowly plants—diatoms or bacillariæ—mere cells of green or brown protoplasm originally, which enclose themselves in a flinty casing fitting together like a box and a lid. Diatoms are, of course, found in fresh-water ponds and salt seas all over the world. Mr. Hobley considers the Rift Valley to have been the scene of tremendous volcanic activity from Tertiary times onwards, and that at one period in its history this enormously long depression in the surface of East Africa was covered by much larger lakes than at the present day. These beds of diatomite are the result both of the existence of these sheets of water and of the neighbouring eruptive volcanoes.

> "Picture Suswa, Longenot, and Eburu all periodically in active eruption, and in addition to lava flows ejecting great clouds of volcanic dust and streams of mud mainly composed of siliceous fragments. This is almost certain to have been thus, as is the case in all volcanoes of this kind: the steam tearing its way through the magma which formed the flows of obsidian and trachytic tuffs would naturally blow large quantities into a state of very fine division, and this would be spread far and wide by the wind and also carried into the lakes by the torrential downpours which always accompany volcanic activity. The soda-laden water would dissolve the silica and place it ready for the diatoms to work upon, and with such rich material to build with one can quite see that this form of life could flourish with great luxuriance."

Mr. Hobley considers this diatomite or kieselguhr may be of some economic value. H. H. Johnston.

---

[1] The Journal of the East Africa and Ugnada Natural History Society. vol. i., No. 1, January, 1910. (London: Longmans, Green and Co., 1910.) Price 5s. net.

NOTES.

The Astley Cooper prize for 1910 has been awarded to Prof. E. H. Starling, F.R.S., for an essay upon the physiology of digestion, gastric and intestinal.

The Mackinnon studentship in physical sciences has been awarded by the Royal Society for a second year to Dr. R. D. Kleeman for the continuation of his researches on radio-activity; and the studentship in biological sciences has been awarded to Mr. T. Goodey for an investigation of the protozoa of the soil.

THE council of the Royal Society of Edinburgh has awarded the following prizes:—(1) The Neill Prize for the biennial period 1907–8, 1908–9, to Mr. F. J. Lewis, for his papers in the society's Transactions "On the Plant Remains in the Scottish Peat Mosses." (2) The Keith Prize for the biennial period 1907–8, 1908–9, to Dr. Wheelton Hind, for a paper published in the Transactions of the society "On the Lamellibranch and Gasteropod Fauna found in the Millstone Grit of Scotland."

THE U.S. Congress has passed a bill granting 10,000*l.* to establish a biological laboratory for the study of diseases of fish, especially those related to cancer. The station is, says *Science*, to be established under the U.S. Fish Commission.

THE committee of the science section of the Japan-British Exhibition has issued invitations to an inspection of the collections at the White City to-morrow, July 22, at 3.30 p.m.

THE Geneva correspondent of the *Times* announces the death, at sixty-four years of age, of Col. Georges Agassiz, nephew of the famous naturalist. After completing his studies at the University of Lausanne, Col. Agassiz spent several years in America with his uncle in scientific work and researches. Recently he presented to the Cantonal Museum at Lausanne his collection of butterflies, numbering 18,000 rare specimens.

IT is stated that a bill is to be introduced into the French Parliament making Greenwich time compulsory instead of Paris time, which differs from it by about nine minutes. If the bill becomes law, France will thus be brought into line with the zone system of referring time to meridians differing by an integral number of hours from the Greenwich meridian. It is thus not so much a question of one country adopting the time standard of another as it is of France accepting an international system of time reckoning. M. Millerand, Minister of Public Works, has been asked by the French Cabinet to support the proposal to substitute Greenwich time for the time of the Paris meridian when the matter is brought before parliament.

IN the House of Commons on Tuesday, a bill "to prohibit the sale or exchange of the plumage and skins of certain wild birds" was brought in and read for the first time. In introducing the bill, Mr. P. Alden said that the object of his bill is to try to prevent the absolute extinction of a few rare birds. The bill that passed the House of Lords in 1905 prohibited the importation of the plumage of almost all birds. Mr. Alden includes in the schedule of the present bill only a few birds that are on the point of extinction, but which may be saved if this bill, or a bill drafted by the Board of Trade, be passed into law within the next year or two. There is a law in Australia to prevent the export of the plumage of certain rare birds, one of which is the emu, yet last year more than one thousand emu skins were catalogued for sale in London—all smuggled out of Australia. A number of species of humming birds are almost extinct. In Trinidad the number of species has been reduced from eighteen to five. The skins of 25,000 humming birds have been catalogued for sale in London during the past year.

WE learn from *Science* that the University of Southern California, at Los Angeles, has established recently a marine biological station at Venice, Cal. The station is on the nearest beach to the university, some thirteen miles distant. It comprises an aquarium consisting of forty tanks with running sea water, and a series of laboratories for class work and research. The laboratories, which face the north, are provided with sea water and fresh water. The station is designed to afford: (1) facilities for demonstration to classes studying marine life; (2) opportunity for the students of the university to carry on advanced work in marine biology; and (3) a limited number of research laboratories, some of which are available, without cost, to investigators who are prepared to carry on research work in some of the phases of marine biology.

THE programme of papers and of demonstrations drawn up for the International Zoological Congress, to be held at Graz next month, includes a great variety of subjects. Prof. Boveri promises an address on Anton Dohrn; Prof. Delage will give an account of experimental parthenogenesis. Embryology will be treated by Profs. Lee, Julin, and Hubrecht. The geographical distribution of several groups of animals will be discussed, more particularly the cave-fauna of Carinthia. Prof. Gaupp will deal with the affinities of the Mammalia, Dr. Keller with the origins of domesticated races, and there are also many other memoirs promised that will attract workers in protozoology, genetics, and experimental embryology. The Graz meeting should prove a very successful one.

IT is officially announced that a submarine telephone cable of a novel type was recently laid across the Channel from Dover to Cape Grisnez by the British Post Office, in order to improve telephonic communication between this country and France, and also to determine the limits of possible improvement by the use of a new type, with a view to its application to telephonic communication between places which have hitherto been beyond telephonic range. This is the first cable of the kind laid in tidal waters and across the open sea, although a similar cable was previously laid in the Lake of Constance. The new cable will be brought into regular use as soon as the corresponding French land lines are completed, but the tests so far made have given very satisfactory results. The electrical conditions of submarine cables make telephonic communication through them difficult as compared with such communication carried on over land lines, and any improvement in their efficiency will have a marked effect in extending the distance through which telephonic speech is possible, and this more especially when the cable forms a considerable part of the total length of line through which communication has to be effected. In the case of the new cable just laid, the efficiency has been increased more than three times beyond the value which it would have if it had not been specially treated. This improved efficiency is due to the insertion of "loading coils" in the cable at intervals of one nautical mile. The coils reduce the distortion of the current impulses which correspond to the spoken sounds, and so render the speech more distinct.

IN the fourth number of the fifty-sixth volume of the Smithsonian Miscellaneous Collections Captain F. Schmitter, of the Medical Corps, U.S. Army, publishes a set of rough notes on the customs and folk-lore of the natives of the Upper Yukon, Alaska. It is remarkable that they are partly in the age of stone and partly in that of copper. The hammers which they use to break up bones for cooking and for making arrow-heads are rude lumps of stone, and of the same material are the axes which, at any rate up to quite recent times, they employed for cutting down trees; but their hunting-knives are of bone, ground flat, and sharp on both sides, or of copper welded in a similar fashion. Their chief weapon, the spear, is made by binding a hunting-knife of caribou horn to a pole 6 feet long.

In a paper recently read before the Royal Society of Arts (see p. 58), Captain A. J. N. Tremearne discusses the origin of that remarkable African race, the Fulah or Filani. The view which he finally adopts is that the tribe arose somewhere in the Central Sudan from the union of Berber males with negro women; that with this mixture of race a mixed dialect came into use, combining Berber, Arabic, and Bantu elements. In process of time this mixed race separated from the Berbers and formed various groups, one going east and south, and becoming the Wahuma, another migrating west to Morocco, and a third, moving south, became the Fans. The quasi-Semitic origin of the tribe has produced a spirit of nationality, and some of their legends now connect them with a Jew or Arab progenitor. At present they form the aristocracy of the Hausa States in North British Nigeria and in French territory to the south and west, their head being the Emir of Sokoto. They are a people with great possibilities, and will doubtless take a high place in West Africa when once they frankly accept British and French supremacy.

The Glastonbury Antiquarian Society has arranged for the publication of a work containing a full description of the excavations at the Glastonbury lake-village, by Mr. Arthur Bulleid and Mr. H. St. George Gray, with an introductory chapter by Dr. R. Munro. The work will also contain reports on the human and animal remains, bird bones, botanical specimens and seeds, and metal, by Prof. W. Boyd Dawkins, F.R.S., Dr. C. W. Andrews, F.R.S., Mr. Clement Reid, F.R.S., and the late Dr. J. H. Gladstone, F.R.S. The Glastonbury lake-village is regarded by archæologists as of primary importance in the history of pre-Roman Britain, giving as it does a vivid picture of native life before the arts of Rome penetrated to the west of England. The village is of the crannog type, the habitable area of about 3½ acres, originally in the middle of a mere, including some eighty dwellings surrounded by a border-palisading. The occupation of this area continued long enough to allow 5 feet of peat to accumulate in some parts during the occupation. The village had its origin in the early Iron age, and has contributed largely to our knowledge of the arts and industries of late Celtic times. The editors hope to be able to publish vol. i. of the work upon the excavations before the close of 1910. Vol. ii. will follow as soon as possible after vol. i., and probably within eighteen months. The work will resemble somewhat in style that of General Pitt-Rivers's "Excavations in Cranborne Chase." Any inquiries regarding the work should be sent (with stamped addressed envelope) to Mr. H. St. George Gray, Taunton Castle, Somerset.

The Dominion Museum at Wellington has issued a hand-list of New Zealand birds, including stragglers, and the first and second parts of a hand-list of New Zealand Lepidoptera.

We have received a copy of vol. vi., No. 9, of the University of California Publications in Zoology, containing a preliminary report, by Mr. G. F. McEwen, on the hydrographical work carried on by the Marine Biological Station at San Diego. Work of this nature was the main reason for the foundation of the Marine Biological Association of San Diego, but various causes prevented its being taken up in earnest until the summer of 1908, when the writer of the report before us became a member of the staff of the station, whose duty it should be to take charge for some portion of the year of water-investigations. The work of 1908 consisted of determinations of the temperature and density of the waters of the Bay of La Jolla and the ocean, the area covered lying between 33° 20′ and 32° 30′ N. lat., and extending from the coast to 118° 30′ long. In addition to this, two trips were made to the Cortez Banks, and a third to a point some distance south of Cerros Island. The methods of work and some of the results obtained are recorded in the report.

Some remarkably fine skeletons of plesiosaurians from the Upper Lias of Holzmaden are described by Dr. E. Fraas, of Stuttgart, in vol. lvii. of the *Palaeontographia*. The author directs attention to the rarity of plesiosaurian remains in the German Lias as contrasting strongly with what obtains in the corresponding English formation. The latter indicates that these saurians were relatively abundant in the Liassic seas, although they did not, in all probability, congregate in such large shoals as the commoner species of ichthyosaurs. The majority of the English specimens come, however, from the Lower Lias of Lyme Regis, Street, and Charmouth, an horizon represented by a different type of strata at Holzmaden. Dr. Fraas refers his specimens to *Plesiosaurus guilelmi-imperatoris*, first named by Prof. Dames in 1895, and to a new species of Thaumatosaurus, which it is proposed to call *T. victor*. So perfect are the remains that they admit of restored figures of the skulls of both species being given. *T. victor* was about 10 feet in length, with a relatively small head, short and thick neck, very plump body, slender and nearly equal-sized paddles, and a very short and powerful tail.

In the Bulletin of the Johns Hopkins Hospital for June (xxi., No. 231) Dr. Corson contributes an interesting biography of Sir Charles Bell, who did so much to elucidate the structure and functions of the nervous system, and whose "Anatomy of Expression in Painting" has remained a classic. Dr. Walker describes glandular structures hitherto supposed to form part of the prostate gland in rats and guinea-pigs, which, however, differ entirely in structure from the latter, and the secretion of which coagulates the secretion of the seminal vesicles when mixed with it. This coagulation is produced by a very minute quantity of the secretion, 1 part to about 21,000 parts of the secretion of the seminal vesicles being sufficient to produce the reaction. The active principle presumably belongs to the class of ferments.

It is a pleasure to note the excellent manner in which the natural history of the American State of Connecticut is being worked up, and the results recorded in a series of pamphlets entitled "Bulletins of the State Geological and Natural History Survey of Connecticut." Five geological and five botanical bulletins have been issued, the last (No. 14) being devoted to a catalogue of flowering plants and ferns. A committee of six members of the Connecticut Botanical Society is responsible for the work, which has been compiled with great care. The list enumerates 1481 native and 461 introduced species, besides which 286 varieties and forms are recognised. The Cyperaceæ, Gramineæ, and Compositæ stand out as the largest families. Aster is the largest genus, and also one of the most interesting, as the native species include such useful horticultural types as *laevis*, *novae-angliae*, *novi-belgii*, *ericoides*, *longifolius*, and the rare *concinnus*; Solidago, another large genus, also provides the original types of some garden plants. The critical genera, Cratægus and Rubus, contribute to the size of the rose family, and the number of Violas is remarkable. Among the ferns, eight species of Isoetes and six of Botrychium are recorded.

THE current number of the Bulletin of the Department of Agriculture, Jamaica (vol. i., No. 3), maintains the high standard set by the two previous issues. Mr. R. Newstead contributes a valuable article on the ticks and other blood-sucking Arthropoda of Jamaica, describing their life-history and the methods adopted in attempts to exterminate them. It appears that ticks are most prevalent during the dry winter months, and that relatively few are found during the rainy season. As a rule the ticks infest cattle, but one much dreaded species, Chrysomyia (Compsamyia), attacks man; a case of myiasis thus produced is mentioned. This tick often passes its larval stages in putrid carcases, and is no doubt kept in check by the scavenger work of the John Crows (*Cathartes aura*), which remove practically all traces of carrion from man's habitations. From an article by the Hon. H. E. Cox, it appears that tea is now being successfully grown on the island; the Cinchona strain is used, and yields a tea of mild character similar to the old China teas and without astringency. There is also a useful history of the economic plants of Jamaica by Mr. Harris.

THE twenty-second annual report of the Agricultural Experiment Station, Lafayette, Indiana, chronicles several important events in the history of the station. The old buildings having proved insufficient, new ones were erected, and were formally opened during the course of the year. Still more important, however, was the provision of further funds, necessitated by the rapidly increasing demand from the farmers of the State for information on the lines of the work already being done. So strong was the demand that the General Assembly amended the Smith Act of 1905, whereby the station annually receives 25,000 dollars, and increased the State subvention to 75,000 dollars annually, to be expended as follows:—10,000 dollars for the general work of the station, 15,000 dollars for the improvement of the crops and soils of the State, 10,000 dollars for the advancement of the dairy interests, 10,000 dollars for the advancement of live-stock interests, 5000 dollars for the investigation of hog cholera and other diseases, 5000 dollars for poultry problems, and 10,000 dollars for extension work; and the Act concludes:—"Whereas an emergency exists for the immediate taking effect of this Act the same shall be in effect from and after its passage." The extension work includes the distribution of copiously illustrated bulletins dealing with important problems, a number of which we have also received; the provision of special trains to carry lecturers through the country, teaching as they go; attendance at shows, and so on. With such liberal support it is not surprising that much good work is done.

MR. ROBERT M. BROWN contributes an interesting series of diagrams to the Bulletin of the American Geographical Society (p. 107) showing the maximum, minimum, and average levels of the waters of the Mississippi system at five stations—Hannibal, on the Mississippi; Hermann, on the Missouri; St. Louis, just below the confluence of the Mississippi and Missouri; Cairo, on the Ohio; and Memphis, Tennessee. The varying influence of the different types of rainfall occurring in different parts of the drainage area is very clearly shown.

MR. H. T. BARNES, Macdonald professor of physics, contributes an interesting paper, with excellent illustrations, to the Proceedings of the Undergraduate Society of Applied Science of McGill University, Montreal, on the problems of winter navigation on the river St. Lawrence. Experience shows that, with Lake St. Peter free of ice, a continuous open channel above that point may be safely predicted, for the river is continually struggling to free itself of its icy burden. Prof. Barnes suggests that it would be quite possible to keep the ice-bridge broken up at the foot of Lake St. Peter and at the Sorel Islands, and that the lake itself could be kept nearly free of ice. One ice-breaker could keep the river clear at the Sorel Islands as well as at Port St. Francis, and this, with one powerful ice-breaker at Quebec, would effectively keep the ship channel open. The ice-problem thus solved, Montreal would inevitably become one of the greatest seaports in the world.

WE have received from the author reprints of two papers by Mr. E. A. Birge, published in the Transactions of the Wisconsin Academy of Sciences, Arts, and Letters. In the first Mr. Birge discusses a hitherto unregarded factor in lake temperatures. The heat of the sun is mostly delivered to the surface strata of a lake, and distributed to the depths by various agencies, chief of which is the wind. The efficiency of the wind as a distributing agent is opposed and limited by thermal resistance to mixture offered by the decreased density of the warmed surface water, and Mr. Birge brings forward evidence to show that the effectiveness of this thermal resistance increases as the temperature of the water departs from the temperature of maximum density, and decreases as it approaches 4° C. The second paper contains a review of the evidence adduced by Wedderburn in favour of the existence of temperature seiches in lakes, which leaves the author unconvinced.

MR. T. S. ELLIS has published a pamphlet on "The Winding Course of the River Wye" (Gloucester: Bellows, price 1*s*.), in which he expresses his views on the origin of adjacent river-systems. He regards valleys divided by cols at their heads as having originally formed a continuous channel, the two sections becoming separated when main systems tended to develop on either side. He does not seem to appreciate sufficiently the effects of rain, frost, and continual land-slide action in the cutting back of valley-heads, but represents geologists as attributing the removal of cols solely to erosion by the young streams flowing from them. On p. 9 he comes very near to the bold suggestion of Mr. A. W. Rogers, that a winding rock-ravine may record the original meanders of the river in alluvium at a higher level.

THE nature of intermetallic compounds is discussed by Dr. T. Slater Price in vol. iii. of the Proceedings of the Birmingham Metallurgical Society, which has made a somewhat belated appearance. The paper in question was read in January, 1909, and contains a list of 120 of these curious compounds, more of which are described every month. Among the laws of their formation, it is claimed that the metals forming a sub-group of the periodic system do not form compounds with each other, and, further, that any particular metal either enters into combination with all the metals of a sub-group or else it does not form compounds with any of them. Those sub-groups in which there is a change from metalloid to metal, as in the case of As, Sb, Bi, form an exception to the rule. The valencies of the metals in their compounds seldom correspond with the ordinary valencies, only thirty bodies out of the 120 enumerated showing this agreement, and of these, twelve are compounds of antimony, which approaches the metalloids in its characteristics. Among the compounds there are some very remarkable formulæ, for which no explanation is offered. For example, the formulæ $NaZn_{12}$, $NaCd_5$, $FeZn_7$, $NiCd_4$, and $AuSb_2$ have a strange appearance. Among other summaries of the state of knowledge on particular subjects, there are interesting articles by Mr. A. H. Hiorns on copper-nickel alloys, and by Prof. Arnold on the testing of metals.

THE problem of determining the vertical motion of the air during a balloon ascent is complicated by the fact that the balloon itself is in motion. Measurement of the variation of the barometric pressure at the balloon has, however, proved a trustworthy means of determining the vertical motion of the balloon, and the further problem of recording the relative vertical motion of the air with respect to the balloon appears to have been satisfactorily solved by an instrument described by Mr. P. Ludevig in the *Physikalische Zeitschrift* for June 15. It consists of light anemometer vanes which can rotate about a vertical axis. The spindle carries a thin, hollow brass cylinder through which six holes are punched, each pair at opposite extremities of a diameter, two near the top, two near the middle, and two near the bottom of the cylinder. The diameters are inclined at 60° to each other. Light can pass through, say, the central pair of holes when they happen to be in the direct line between a source and a moving strip of photographic paper, and a spot is registered. According to the direction of rotation of the cylinder, the spot next registered may be the upper or lower, and the speed of rotation determines the distance between the spots. An examination of the strip allows the speed of the air with respect to the balloon at any instant to be calculated if the speed of the strip is known.

THE Ontario Government announces that the system organised for the distribution of power from the Niagara Falls will be in operation for the supply of Toronto, London, and St. Thomas by the end of the year. The most distant of these places is about 100 miles from the Falls, and the transmission will be at 100,000 volts. The electrical energy will be bought from the existing Canadian generating stations by the various municipalities, which will effect the distribution by new transmission lines extending over a wide area. By this means cheap power will be available for manufacturing and agricultural purposes, and it is hoped that a network of new tramways will be constructed which will not only improve travelling facilities, but also act as a means of bringing agricultural produce to the towns. A system of distribution of this kind should be of particular value in Canada, seeing that the supply of coal is deficient. The municipalities will not themselves own the tramways, lighting and power companies, but private companies will be formed to effect the final distribution of the power, and the control of the price charged to the consumer will rest with the municipalities in virtue of their ownership of the transmission lines. The cost of carrying out the above scheme will be defrayed by an issue by the Provincial Legislature of bonds redeemable at the end of forty years.

MESSRS. TOWNSON AND MERCER have submitted for our inspection a technical thermometer based on a novel principle. This consists of a metallic bulb containing liquid, and connected by narrow copper tubing with a pressure gauge. The gauge index responds to the variations in pressure of the contained vapour, and this depends upon the temperature of the bulb. The dial of the gauge can therefore be graduated in degrees instead of pressures, and is thus made into a direct-reading thermometer. The indications may, of course, be automatically recorded, as in the case of an ordinary aneroid barometer. The indications depend only upon the temperature of the bulb; they are independent of the temperature of the gauge, *which may be any distance away*, the air in the capillary tubing forming the connecting link which transmits the pressure of the vapour in the bulb. Damage to the bulb or capillary tube does not interfere with the accuracy of the indications; the bulb and tube may, in fact, be twisted or bent in any way which leaves them intact and does not prevent free communication of the vapour pressure. It will be seen at once that the thermometer possesses qualities which no other thermometer of the same simplicity can claim, and the result is that it is rapidly being adopted in works of all kinds where long-distance thermometry is advantageous. For example, in a single cabin of a ship may be dials indicating the temperature in any part of the hold, in powder magazines, coal-bunkers, refrigerating chambers, &c. Humidity is indicated by employing a pair, wet and dry, in the ordinary way. Its use in indicating the temperature of superheated steam has caused it to be adopted by all railways in France and by many other railways on the Continent. These thermometers are made of very various ranges, from −25° C. to +25° C., up to 450° C. to 700° C. This system of temperature indication is known as the "Fournier" system.

THE Journal of the Franklin Institute for June contains an article by E. E. Free on the phenomena of flocculation and deflocculation, a discussion of the mechanics of suspension, a subject of importance in the treatment of sewage, in ore separation, and many other commercial problems. The physical production of light forms the subject of a paper by E. P. Hyde, and is dealt with from the points of view of the laws of radiation and of physiological optics. There are also articles on Brennan's monorail car, the colloid nature of complex inorganic acids, and the Lumière process of colour photography.

THE *Bulletin de la Société d'Encouragement pour l'Industrie nationale* for May contains a paper by J. H. Ricard on the pine forests of the Landes. Full details are given, with numerous photographic illustrations, of the methods now employed for the extraction of the resin (*gemme*), and the extraction of essence of turpentine and rosin from the latter. Figures are given showing the yield of pine wood per hectare, and the proportions of the wood suitable for various uses. The financial aspect of the industry is dealt with fully, and the great advantages of the cultivation of the pine in these sandy districts pointed out.

THE electrolytic conductivity of non-aqueous solutions at low temperatures is the subject of a paper by P. Walden in the current number of the *Zeitschrift für physikalische Chemie* (June 17). Twelve organic solvents were used, tetraethylammonium iodide and tetrapropylammonium iodide being used for the "normal electrolytes," the observations in each case being carried down to the freezing of the solvent. The general result of the work shows that, as with aqueous solutions, the conductivity curve does not cut the temperature axis with a measurable angle; in other words, there is no definite temperature of conductivity.

THE 22,000-ton floating dock for the Brazilian Government is illustrated in the *Engineer* for July 8. This dock has been built by Messrs. Vickers, Sons and Maxim, Barrow-in-Furness, at a cost of 182,700*l.*, and is the largest dock of the kind built as yet in this country. The contract time for delivery at Rio Janeiro was eleven months. The contract was placed on October 4 last, and the dock sections were launched on June 7, 8, and 9. The designs were prepared by Messrs. Clark and Standfield, of London, who have already been responsible for sixty-seven floating docks having an aggregate lifting capacity of 486,691 tons. The present dock is surpassed by the 35,500-ton dock built last year by Blohm and Voss at Hamburg. Its lifting capacity will also be exceeded by two box-type docks now building at Portsmouth and Sheerness for the British Admiralty, which are expected to be ready for service during the autumn of next year.

THE aërial-propeller testing plant at Vickers' Works, Barrow-in-Furness, is illustrated in *Engineering* for July 8. The apparatus consists of a double cantilever, 166 feet in length, the longer arm, at the end of which the propeller under test is mounted, being 110 feet in length. The cantilever is carried on ball-bearings on a cast-iron column, and the propeller is driven from a 100 horse-power electric motor situated in a test house which is arranged on the cantilever near the supporting column. The power is conveyed to the propeller by means of a long shaft passing along the cantilever, and bevel gear. The cantilever may revolve at any speed up to 70 miles per hour at the point of attachment of the propeller. The structure is balanced by a weight on the shorter arm of the cantilever. There is a method of compensating the circular motion of the propeller so that the conditions are similar to those of a ship running in a straight line through the air. The propeller may be run at speeds from 500 to 1000 revolutions per minute, and its speed through the air can be regulated by means of resistance screens. Measurements of thrust, efficiency, &c., are recorded in the observation station. Provision has been made for attaching a gondola to the platform ahead of the propeller, so as to obtain similar conditions to those on an air-ship having the propeller astern of the gondola. With characteristic solicitude for the advancement of science generally, Messrs. Vickers will place the apparatus at the disposal of investigators, so that any type of propellers may be tested.

METEOROLOGISTS, teachers of practical geography, and others will all find Messrs. Aitchison and Co.'s catalogue, Section iv., useful and interesting. It is concerned chiefly with barometers, thermometers, rain gauges, compasses, and pedometers; and the excellent illustrations and clearly arranged letterpress make reference easy and pleasant.

A THIRD edition of Prof. Ch. Moureu's "Notions fondamentales de Chimie organique" has been published by M. Gauthier-Villars, of Paris. The first edition of the work was reviewed in our issue of January 22, 1903 (vol. lxvii., p. 269), and it is only necessary to state that the present volume has been revised and brought up to date.

"AFRICAN MIMETIC BUTTERFLIES" is the title of a monograph by Mr. H. Eltringham which the Oxford University Press is about to publish. Descriptions and illustrations are given of the principal known instances of mimetic resemblances in the Rhopalocera of the Ethiopian region, together with an explanation of the Müllerian and Batesian theories of mimicry.

A VALUABLE supplement of seventy pages, dealing with Japan in all its aspects, was published with Tuesday's *Times* (July 19). Among the numerous important articles we notice in particular those on education, seismology, and volcanoes, by Baron Kikuchi, Prof. F. Omori, and Mr. E. Bruce-Mitford respectively. The publication, as part of a daily newspaper, of such a vast amount of detail and description relating to Japan as is given in the articles and tables is a remarkable enterprise. The supplement contains more information upon the position and progress of Japan than can be found in many books.

A SECOND edition of Prof. Armstrong's book of essays, "The Teaching of Scientific Method and other Papers on Education," has been published by Messrs. Macmillan and Co., Ltd. The first edition was reviewed at length in our issue of January 28, 1904 (vol. lxix., p. 289), and it will be sufficient to direct attention to the additions made in the present volume. Prof. Armstrong has introduced a prefatory essay entitled "Twenty-five Years Later," in which he considers the changes that have taken place in the teaching of science in schools during the period to which his essays relate. He has added two contributions; one, "The Correlation of Mathematical Teaching with other Work in Schools," was part of a report presented to the British Association at its York meeting, and the other, "A Criticism of School Method, with Suggestions for its Improvement," was delivered as an address to the Portsmouth Secondary Education League.

THE following volumes of the "Fauna of British India" series are nearing completion:—Mr. G. J. Arrow's volume on the Cetoniinæ and Dynastinæ is practically ready for publication. Mr. W. L. Distant's volume, an appendix to the Rhynchota, and Canon W. W. Fowler's work on the Cicindelidæ and Paussidæ, with a general introduction to the Coleoptera, are in the press. The remaining volumes which the editor, Mr. A. E. Shipley, with the assistance of Mr. Guy A. K. Marshall, and with the sanction of the Secretary of State for India, has arranged for in this series are:—Volumes on the Orthoptera (Acridiidæ and Locustidæ), Mr. W. F. Kirby; Butterflies (Lycænidæ and Hesperidæ), Mr. H. H. Druce; the Curculionidæ, Mr. G. A. K. Marshall; the Ichneumonidæ, Mr. Claude Morley; the Longicorn Beetles, Mr. C. J. Gahan; the Blattidæ, Mr. R. Shelford; the Helicidæ, Lieut.-Colonel H. H. Godwin-Austen; the Ixodidæ and Argasidæ, Mr. C. Warburton; Leeches, Mr. W. A. Harding; Fresh-water Sponges and Polyzoa and Hydrida, Dr. N. Annandale; the Meloïdæ, Mr. Creighton Wellman; the Brachyurous Crustacea, Lieut.-Colonel A. Alcock; and the Nemocera (excluding the Chironomidæ and the Culicidæ), Mr. E. Brunetti.

THE annual report of the Board of Scientific Advice for India for 1908–9 has been received. The attention of the Board has been directed to the fact that the rapid increase in the number of scientific institutions throughout the world is rendering it more difficult to obtain back numbers of the more important scientific periodicals, and that unless efforts are made now to secure complete sets of some of these for India it will be impossible at a later date to establish efficient libraries for the requirements of scientific research in India. The Board, on the advice of a sub-committee appointed to deal with the question, has recommended the Government to maintain "first-class" general reference libraries in Bengal, Bombay, Burma, Madras, the Punjab, and the United Provinces, and "second-class" libraries in large towns like Cawnpore, Mandalay, Nagpur, Simla, and so on. Lists of scientific periodicals which should be maintained in all "first-class" libraries and in "second-class" libraries accompanied the recommendations. The programmes of the various scientific departments of Government for the ensuing year were, after some revision, approved by the Board. In connection with the work of the Meteorological Department, it is proposed to make a series of balloon flights next December, the month chosen by the International Commission in Europe and America for simultaneous experiments on the conditions of the upper air. It is hoped, too, that the publication of the sixty years' records in connection with terrestrial magnetism at Colaba will be completed during the current year. The Department of Agricultural Bacteriology hopes to attack, among other problems, the determination of the chief bacteria characteristic of Indian soils, particularly those taking part in the fixation of nitrogen, the rotting of organic material, and nitrification. In other departments interesting research work is being pursued actively. Very complete reports of the work done during the year 1908–9 in each of the scientific departments is included in the volume; to name a few, that dealing with astronomy and meteorology is by Dr. G. T. Walker, F.R.S.; that in geology by Sir Thomas Holland, F.R.S.; and in geodosy and geography by Colonel S. G. Burrard, R.E., F.R.S. An appendix on the economic investigations conducted at the Imperial Institute, by Dr. W. R. Dunstan, F.R.S., completes the volume.

OUR ASTRONOMICAL COLUMN.

PHOTOGRAPHS OF AURORÆ.—As an abstract from the *Comptes rendus*, we have received from the author, M. Carl Störmer, an interesting note on a photographic method of determining the altitudes of auroræ. The difficulty in obtaining such photographs is, of course, the extreme feebleness and the motion of the light, but, by using a cinematograph lens of 25 mm. diameter and 50 mm. focal length, in conjunction with Lumière's "violet" plates, M. Störmer succeeded in obtaining measurable images, some of which are reproduced in his note. By choosing two stations 4·3 km. apart and arranging for simultaneous exposures, data for determining the altitudes were secured. The four sets of photographs reproduced represent different forms of auroræ seen during March, and also show recognisable stars, so that the parallax of definite points is easily calculated. The heights determined are 166 km., between 50 and 60 km., 190 km., and 120 km. respectively.

DISPLACEMENT OF SPECTRAL LINES AT THE SUN'S LIMB.—In spectroscopic determinations of the radial velocities of the various solar layers, a difficulty arises from the fact that various perturbations alter the wave-lengths of the lines considered, independently of the rotation. These subsidiary displacements have been ascribed to two causes, first, the effect of ascending currents in the solar atmosphere, and, secondly, to pressure effects. In order to decide which of these is the disturbing agent, M. A. Perot performed some delicate interferometer experiments which he describes in No. 1 (July 4) of the *Comptes rendus*. In order to determine definitely the exact point of the solar image under observation, M. Perot projected a 36 mm. image on to a copper plate ruled in millimetre squares, and having a circular hole, or a slit, 0·1 mm. broad at the centre; thus only the radiations passing through this definite aperture reached his interferometer and spectroscope. As a result of the experiments, M. Perot deduces, from the form of the curves of relative variation of wave-length obtained, that this relative variation is an effect of pressure, or density, and not of ascending currents.

THE PRESSURE OF LIGHT ON GASES.—In No. 5, vol. xxxi., of the *Astrophysical Journal*, Dr. Lebedew describes a series of very ingenious and delicate experiments by which he has been able to observe the effect of the pressure exerted by a beam of light on various gases. The apparatus is too complex to describe here, but, in effect, it consists of a small chamber in which the gas under examination is contained, and through which a beam of light can be projected in either direction. The pressure exerted by the light produces an excess of pressure in the gas at the farther end of the chamber, and this acts on a very delicate valve which is suspended on one arm of a torsion balance. From a large number of experiments, in which other variable effects were eliminated, Dr. Lebedew succeeded in establishing experimentally the existence of the translatory force exerted by light upon gases, and also in showing that these forces are directly proportional to the quantity of incident energy and to the absorption coefficients of the gas masses. As these experiments were made with gases at atmospheric pressure, the numerical values determined cannot be applied directly to such excessively tenuous masses as are involved in the case of comets' tails, but they provide a satisfactory basis on which further experimental work in this direction may be founded.

THE DETERMINATION OF STELLAR RADIAL VELOCITIES.—In No. 5, vol. xxxi., of the *Astrophysical Journal*, Prof. Frost publishes a table of corrections to be applied to the previously published list of radial velocities of certain stars of the Orion type. The corrections are necessitated by the re-determination of the wave-lengths of the three silicon lines at λλ 4553, 4568, and 4575, for which Exner and Haschek's values were previously adopted. Prof. Frost's new measures give 4552·636, 4567·897, and 4574·791 as the correct wave-lengths, and this involves positive corrections of 7·51 km., 3·48 km., and 7·14 km., respectively, to plates reduced with Exner and Haschek's values.

As Prof. Frost points out, finality in radial-velocity measures is hardly to be obtained; the values must be amended as a greater accuracy in the determination of stellar wave-lengths is attained. Further, in the case of blended lines, such as the double helium line at λ 4472, a variation in the relative intensities of the two lines will considerably modify the results. This is especially effective when the adopted blend is uncertain, as in the case of the blending of lines of different elements which may vary considerably from one stellar type to another. Prof. Frost also publishes the data establishing the variable radial-velocity of Rigel, showing a variation from +1 to +26 km., and states that on one plate a faint component to the line at λ 4472 was measured which gave a velocity of −108 km.; faint components were suspected in other instances.

The same journal also contains some further notes by Prof. R. W. Wood on the determination of radial-velocities with objective prisms. After trying several other media for producing fiducial lines, he tried peroxide of chlorine, which, contained in a suitable cell, appears to answer very well. It gives absorption bands which are very well defined on the red edge, and in his 21-foot grating photographs can be measured to within 0·02 Å.U.; with such bands, he suggests, radial velocities, of suitable stars, could be determined to within 2 or 3 kms. Unfortunately, the absorption bands cover most of the hydrogen lines, so that this absorbent could not well be used for first-type stars, although it is possible that λ 4863 and λ 3837 would appear; for other types a peroxide of chlorine screen apparently answers perfectly.

HALLEY'S COMET.—A number of observations are recorded in *Astronomische Nachrichten*, No. 4425, but, in general, they do little more than confirm others previously noted.

Herr G. Müller gives an outline of the observations made, at great altitudes, in Teneriffe, and Herr W. Münch describes the general observations at Potsdam. The spectrographic observations made on May 19, from 4h. 55m. to 5h. 10m. and from 5h. 28m. to 5h. 30m. (M.E.T.), are described by Herr v. d. Pahlen, but no modification of the normal solar spectrum was discovered. The slit covered 3½′ of arc, and two series of six exposures on the predicted positions of the comet on the sun's disc were made, so that a large area of the solar surface was covered without revealing any trace of the comet.

An observation by Dr. Ristenpart, at Santiago de Chile, on July 1 showed the comet as a nebulous mass 1′ in diameter, with no condensation, and with a tail 2° long.

HARVARD COLLEGE OBSERVATORY.—In his report for the year ending September 30, 1909, Prof. E. C. Pickering deplores the diminution of 5000 dollars in the income of the Harvard College Observatory, and points out that a disproportionate decrease will have to be expected in the amount of work accomplished. As in previous years, a great number of negatives of stellar regions and stellar spectra were added to the magnificent collection now stored at Harvard, and a number of important discoveries were made from the Draper memorial photographs. Seven meteor trails were found on chart plates, and at Arequipa the spectrum of a very bright meteor was secured. At this southern station the work was sadly upset by unusually bad weather, but, among other things, the spectra of more than 400 stars of magnitudes 5–6 were secured with the 13-inch Boyden telescope.